Forest Health Protection

Pacific Southwest Region
Northeastern California Shared Service Area

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To: District Ranger, Beckwourth Ranger District, Plumas National Forest

Subject: Evaluation of stand conditions and bark beetle activity in the Hayden Project (FHP Report NE13-01)

Summary

At the request of Geoffrey Kaeberle, Silviculturist, Beckwourth Ranger District, I visited the Hayden Project on September 20, 2012. The objective was to evaluate the current forest health conditions within the stand, discuss what influence these conditions would have on stand management objectives and provide recommendations as appropriate. Geoffrey Kaeberle accompanied me to the field.

Key findings:

- Several native forest insects and diseases were found throughout the project area contributing to tree mortality including bark beetles, sawflies and dwarf mistletoe.
- Aerial detection surveys from 2010 – 2012 mapped approximately 800 acres of mortality, consisting of mostly white fir, within and adjacent to the project area ranging from 1 to 5 dead trees per acre.
- Overstocking is putting many stands at risk to elevated levels of bark beetle-caused tree mortality during periods of drought.
- High fuels loads, consisting of an abundance of dead-down trees and a dense understory of live trees; put many stands at risk to stand replacing wildfire.

Thinning is recommended throughout the Hayden project area to reduce stocking levels to increase the health and vigor of residual trees and reduce the abundance of white fir. Specific recommendations are provided in this evaluation.

Description of the project area

The Hayden Project is located just northeast of the community of Delleker, CA (T23N, R13E). The elevation of the site ranges from 5000 to 7200 feet with annual precipitation ranging from 30 –

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40 inches. Low elevation and south facing slopes at the southern end of the project area are a mix of ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*Pinus jeffreyi*), Douglas-fir (*Psuedotsuga menziesii*), incense cedar (*Libocedrus decurrens*), and sugar pine (*Pinus lambertiana*) while north facing upper elevation slopes consist of white fir (*Abies concolor*), red fir (*Abies magnifica*), sugar pine, incense cedar, Douglas-fir, ponderosa and Jeffrey pine.

Management objectives

A variable thinning strategy is planned for most stands in the Hayden project area. Variable thinning would reduce stand basal area in mixed conifer areas to ~130 sq.ft./acre and change species composition to a more sustainable condition by removing trees from all size classes (< 30" dbh), reducing the amount of white fir, creating gaps and clumps, and removing competition from around larger diameter trees. Eastside pine stands would be thinned to ~80 sq.ft./acre with openings created for regeneration. These types of treatments would begin to move stands to a more resilient condition that is consistent with Regional ecosystem restoration goals.

Forest insect and disease conditions

Note: All observations of stand conditions and associated insect and disease activity were made from system roads, vantage points and supplemented with aerial detection survey data from 2010 - 2012. Most proposed treatment units are adjacent to established roads.

- High stand density and in some locations, dwarf mistletoe, have contributed to an increase in bark beetle-caused tree mortality within the project area. Most of this mortality is occurring in white fir but scattered mortality of Jeffrey pine and sugar pine is also apparent.

- Fir engraver beetle (*Scolytus ventralis*) is attacking and killing white fir resulting in the highest level of mortality found within the project area. Lots of evidence exists, in the form of old snags and downed logs, of past true fir mortality from the 1987-1992 drought event.

- Jeffrey pine beetle (*Dendroctonus jeffreyi*) has attacked and killed two small pockets of Jeffrey pine.

- High infection levels of western dwarf mistletoe (*Arceuthobium campylopodum*) were observed in Jeffrey pine stands on shallow soils. A few trees are being attacked by Jeffrey pine beetle and possibly wood boring beetles such as the California flatheaded borer (*Melanophila californica*).

- White fir dwarf mistletoe (*Arceuthobium abietinum* f. sp. *concoloris*) was observed in a few areas contributing to branch flagging and branch and bole deformity of white fir.

- White fir sawfly (*Neodiprion abietis*) caused defoliation was moderate on most white fir within and adjacent to project area. No mortality was associated with this defoliation.

- Heterobasidion root disease (*Heterobasidion occidentale*) was found in one white fir stump but likely exists in the majority of stands where white fir is a major species component.

Stand conditions and mortality related to recent and future climate trends

Many of the forested areas in the Hayden project appear to be well above "normal" stocking levels and in drier years have exhibited an elevated level of tree mortality caused by bark beetles; especially fir engraver beetle-caused mortality of white fir. This mortality combined with high stand density has resulted in heavy fuel loading in some areas and a corresponding increase in fire danger.

Trees that succumb to bark beetle attacks are typically predisposed by other factors that compromise their health and vigor. In the Hayden project area, high stand density, prolonged drought, dwarf mistletoe and Heterobasidion root disease are all contributing factors.

Successive dry years can exacerbate unhealthy stand conditions, such as those that exist within most Hayden project stands. This typically results in higher levels of bark beetle-caused tree mortality. Recent aerial detection surveys suggest that the successive dry years from 2007 to 2009 lead to increased levels of tree mortality in 2010 and 2011.

The majority of the project area's average annual precipitation of 30 – 40" put white fir at a moderate risk to mortality without factoring in stand density and disease (D. Schultz 1994, FHP Report 94-2). Therefore, even with lower stocking levels, white fir growing on this site is at an elevated risk for fir engraver beetle caused mortality during drought.

Predicted climate change is likely to impact trees growing in this stand over the next 100 years. Although no Plumas National Forest specific climate change models are available at this time, there is a general consensus among California models that summers will be drier than they are currently. This prediction is based on the forecasted rise in mean minimum and maximum temperatures and remains consistent regardless of future levels of annual precipitation (K. Merriam and H. Safford, *A summary of current trends and probable future trends in climate and climate-driven processes in the Sierra Cascade Province, including the Plumas, Modoc, and Lassen National Forests*). The risk of bark beetle caused tree mortality will likely increase for all conifer species under this scenario, especially drought intolerant white fir and dense stands of ponderosa/Jeffrey pine. Improving the resilience of stands to future disturbance events through density, size class and species composition management will be critical to maintaining a healthy forested landscape.

Considerations for thinning treatments

The thinning treatment being considered for this project will reduce stocking to an average basal area of 130 sq.ft./acre in mixed conifer and 80 sq.ft./acre in eastside pine. This treatment should effectively reduce inter-tree competition for limited water and nutrients and reduce the risk of insect and disease-caused mortality for most treatment units. Untreated areas would remain at a higher risk of insect and disease caused mortality, especially during periods of drought.

When planning thinning treatments, it should be recognized that the target stand density is an average to be applied across the landscape and some variability may be desired. Individual high value trees, such as mature pines, should benefit by having the stocking around them reduced to lower levels. Allowing for denser tree spacing and pockets of higher canopy cover may be desirable around potential wildlife trees, such as forked and/or broken-topped trees. This type of ecological restoration approach would also be consistent with the Region 5 Ecological Restoration

Strategic Priority.

When implementing thinning projects, retaining more drought tolerant species such as ponderosa pine, Jeffrey pine and incense cedar over white fir will increase species diversity and make stands more resilient to disturbance. In addition, when selecting trees for removal, preference should be given to trees heavily infected with dwarf mistletoe, root disease and trees infested with bark beetles. Small group selections could be utilized to remove true fir that are within known Heterobasidion root disease centers and/or are heavily infected with dwarf mistletoe. This would create openings that could be planted with non-host species.

It is recommended that a registered borate compound be applied to all freshly cut conifer stumps >14" to reduce the chance of creating new infection centers of *Heterobasidion irregulare*, formerly referred to as P-type annosus root disease and *Heterobasidion occidentalis*, formerly referred to as S-type annosus root disease.

Sugar pine should be retained as much as possible during any thinning operation in order to preserve genetic diversity, especially white pine blister rust (*Cronartium ribicola*) resistant individuals. White pine blister rust, a non-native pathogen, has continued to weaken and kill this species over most of its range since its introduction into the Pacific Northwest in 1910. Identification and protection of local rust resistant trees for seed collection, if not already occurring, will aid in the future planting of rust resistant seedlings. Planting selected openings created through thinning operations with rust resistant stock would help insure this species persists in the area.

Considerations for prescribed fire

If prescribed fire is used as a follow-up treatment to stand thinning, unacceptable levels of large diameter pine mortality may occur depending on management objectives. This mortality most often occurs as a direct result of cambium or crown injury to individual trees during the fire. Mature ponderosa, Jeffrey and especially sugar pines are susceptible to mortality during prescribed burns because of the deep duff and litter that has accumulated at their base in the absence of fire. These duff mounds typically burn at a slow rate, while maintaining lethal temperatures, causing severe cambium injury. To protect individual large diameter pine from lethal cambium injury, raking the duff away from the bases of these trees before burning (within 24" of the bole and down to mineral soil) is recommended.

Potential for FHP Funding

Forest Health Protection may be able to assist with funding, including NEPA, for thinning and removing green material from overstocked areas within the Hayden project area. Thinning projects in this area would meet the minimum requirements for western bark beetle funding and are supported by this evaluation. If you are interested in this competitive funding please contact me for assistance in developing and submitting a proposal.

If you have any questions regarding this report and/or need additional information please contact Danny Cluck at 530-252-6431.

/s/ Danny Cluck

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